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THE PHLEBOTOMINAE OF NIGERIA (DIPTERA : PSYCHODIDAE)

By D. J. Lewis

(*Scientific staff, Medical Research Council, London ; care of British Museum (Natural History)*)

AND

B. McMillan

(*School of Public Health and Tropical Medicine, Sydney, N.S.W.*)

In this paper we assemble all available old records of Phlebotominae in Nigeria, together with our own, most of which are based on specimens collected in the north (by B.M.) particularly at Kankiya. The study of these flies is of interest in relation to oriental sore and kala azar. The latter seems to have a patchy distribution in Africa but may be more widespread than now appears (Manson-Bahr, 1959 : 157). It is not definitely known to occur in Nigeria where, as will be seen, phlebotomines apparently seldom attack man.

We have used the usual nomenclature for the male terminalia although Snodgrass (1957) points out that it is not strictly correct.

Initials in brackets are those of collectors whose names appear in the section on acknowledgments.

We are using Theodor's (1948) arrangement of genera and subgenera for the present.

The Species and Their Known Distribution

Phlebotomus (*Phlebotomus*) *dubosqi* Neveu-Lemaire

Phlebotomus roubaudi Newstead (*teste* Theodor, 1958).

The distribution of this species is of particular interest because it is closely related to the important man-biting species, *P. papatasi* (Scopoli), and is regarded by Parrot and Gougis (quoted by McMillan, 1957) as the vector of cutaneous leishmaniasis in the Niger Territory. Austen (1909) reported that *P. dubosqi* had been collected on the Cross River in Southern Nigeria in 1906, but Newstead (1912) stated that Austen doubted whether the determination was correct. This species was recorded from Nigeria by Sinton (1930), de Meillon and Lavoipierre (1944) and Kirk and Lewis (1951), probably on the basis of Austen's original record. Examination of 20 specimens in the British Museum, evidently those mentioned by Austen, has shown that they belong to three species of *Sergentomyia*, and it appears that the records of *P. dubosqi* given below are the first authentic ones from Nigeria.

One of the few specimens of this species found was taken in a hut, and it is likely that *P. dubosqi* in Nigeria, like *P. papatasi* in many areas, is closely associated with man.

Distribution.—Kankiya (McMillan, 1957), v, vi.56, i.57, v.58, in hut (*P. W. H.*).

Phlebotomus (*Anaphlebotomus*) *rodhaini* Parrot

Phlebotomus rodhaini Parrot, 1934.

Distribution.—Kankiya.

Sergentomyia (*Sergentomyia*) *antennata* ssp. *antennata* (Newstead)

Phlebotomus antennatus var. *occidentalis* Theodor, 1933.
Phlebotomus occidentalis Parrot, 1948 ; Abonnenc, 1958*a*.

Distribution.—Abuja (*R. W. C.*); R. Cross, 1906 (*R. W. G.*); Daudawa; Daura; Diko; Funtua; Gadau (Theodor, 1933); Kankiya; Katsina; Lokoja (*R. W. C.*); Maiduguri (*T. A. M. N.*); Makurdi; Malumfashi; Minna; Zaria.

The Cross River enters the sea near Calabar, and Simpson (1912) points out that Gray's locality was not specified.

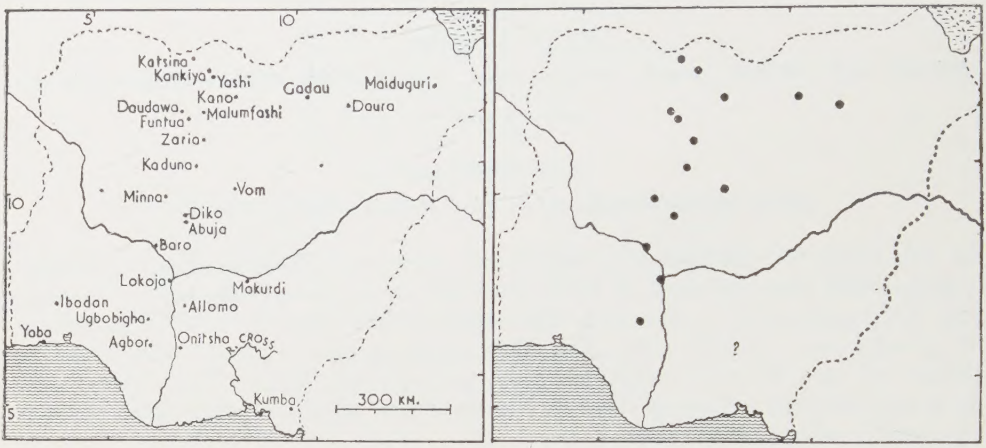

FIG. 1.—(Left) Nigeria, showing places mentioned in the text. (Right) the known distribution of a common species, *Sergentomyia bedfordi*.

Sergentomyia (*Sergentomyia*) *dubia* Parrot, Mornet and Cadenat

Phlebotomus antennatus var. *dubius* Parrot, Mornet and Cadenat, 1945.
Phlebotomus dubius Parrot, 1951.

Distribution.—Daura; Diko; Gadau (Theodor, 1933, as *P. minutus* var. *antennatus*); Kankiya; Katsina.

Sergentomyia (*Sergentomyia*) *bedfordi* (Newstead)

Phlebotomus bedfordi Newstead, 1914.

The cibaria of many females from Kankiya were removed from the head and pressed in order to separate the teeth from the pigmented plate. The teeth were found to vary greatly in number and uniformity, and the pharyngeal armature also varied in shape. Three forms could be recognised, *S. bedfordi bedfordi* Newstead, *S. b.* var. *bereiri* and *S. b.* var. *congolensis* Bequaert and Walravens, but intermediates were often found and it may be that *bereiri* and *congolensis* should be treated as variants and synonyms of *S. b. bedfordi*. Inspection of many specimens from other territories should settle this matter, and meanwhile we refer to them all as *P. bedfordi*.

Distribution.—Baro, 1910 (Newstead, 1914, as *P. minutus* var. *africanus*); R. Cross, 1906 (*R. W. G.*); Daudawa; Daura; Diko; Funtua; Gadau (Theodor, 1938); Kaduna; Kankiya; Kano; Katsina; Lokoja (Theodor, 1938); Minna; Ugbobigha and Vom (*W. A. M.*); Zaria.

Sergentomyia (*Sergentomyia*) *buxtoni* (Theodor)

Phlebotomus buxtoni Theodor, 1933.

Distribution.—Daudawa; Daura; Funtua; Kankiya; Katsina; Malumfashi; Zaria.

Sergentomyia (*Sergentomyia*) *schoutedeni* (Adler, Theodor and Parrot)

Phlebotomus schoutedeni Adler, Theodor and Parrot, 1929.

This form is very closely related to *S. bedfordi* but we did not see enough Nigerian specimens to form an opinion as to whether it might be placed as a subspecific form of this species.

Distribution.—Two females from Kankiya, in which the pharyngeal armature has little forward curvature, may be this form. A single female from Kumba has a rather similar pharyngeal armature but a very strongly constructed pharynx and about 30 cibarial teeth ; it may be *schoutedeni* but a decision on its status is being delayed until more specimens are available.

Sergentomyia (*Sergentomyia*) *simillima* (Newstead)

Phlebotomus simillimus Newstead, 1914.

Specimens from Abuja, Lokoja and Makurdi were found to belong to the type form and not to the forms *hamoni* and *inermis* described by Abonnenc (1958*b*).

Distribution.—Abuja (*R. W. C.*) ; Agbor (Theodor, 1938) ; " Alumu " (probably Allomo) and unspecified places (Newstead, 1914) ; Ibadan and Lokoja (Theodor, 1938) ; Makurdi.

Sergentomyia (*Sergentomyia*) *schwetzi* (Adler, Theodor and Parrot)

Cleared specimens (from Kankiya) had a rather yellow general coloration so that the coxites of the male looked dark by contrast. The females are probably indistinguishable from those of *S. murphyi* sp. n.

Distribution.—The following localities may be those of *S. schwetzi* only : Daudawa ;

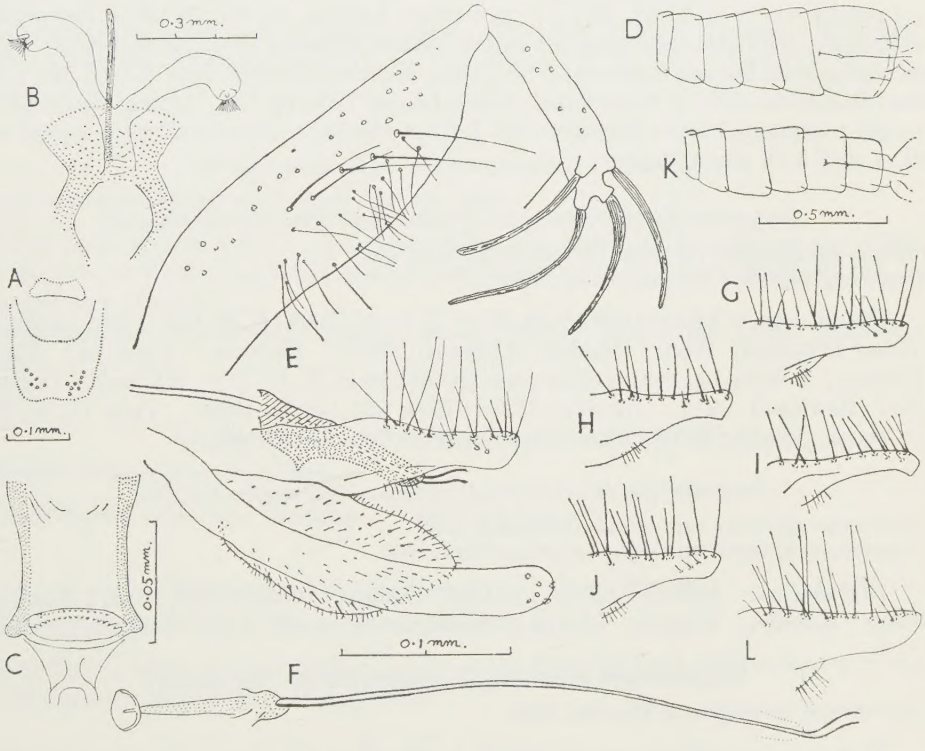

FIG. 2.—*Sergentomyia murphyi* sp. n. *Female :* (*A*) first two abdominal sternites ; (*B*) spermathecae and furca. *Male :* (*C*) cibarium ; (*D*) abdominal segments ; (*E*) terminalia ; (*F*) genital pump and filaments ; (*G*)–(*J*) tip of paramere in different specimens. *S. schwetzi* (A., T. and P.), male, for comparison : (*K*) abdomen ; (*L*) tip of paramere.

Diko ; Gadau (Theodor, 1938) ; Ibadan, 8.vi.53 (*H. J. S.*), biting in house at 10 p.m.; Kaduna ; Kankiya ; Kano ; Katsina ; Maiduguri (*T. A. M. N.*) ; S. Nigeria, 1914 (*W. A. L.*): Ugbobigha (*W. A. M.*) ; Yaba, 1928 (*V. B. W.*). Males of *S. schwetzi* have been found at Kaduna, Kankiya, Katsina, Lokoja, Ugbobigha and Yaba.

Sergentomyia (Sergentomyia) murphyi sp. n. (Fig. 2)

Female.—Antenna : A3 = <4 + 5 ; A3/E = 1·1 (1·1–1·2) ; ascoid 4 = 0·4 of segment. Palp : segment 4 = 1·0 (1·0–1·1) times as long as 3. Cibarium and pharynx as in *S. schwetzi* ; pigmented plate ill-defined and obscured by pigment of ventral wall of cibarium. Wing : length 1·91 (1·84–2·02) mm.; width 0·44 (0·40–0·47) mm.; index 0·9 (0·7–1·1). Second abdominal sternite pale and deeply concave anteriorly. Spermatheca as in *S. schwetzi*.

Male.—Antenna : A3 = < 4 + 5 ; A3/E = 1·2 (1·2–1·3) (*n* = 5) ; ascoid 4 = 0·3 of segment. Palp : segment 4 = 1·0 (1·0–1·1) times as long as 3 (*n* = 4). Cibarium with about 16 pointed teeth, and minute teeth at their bases ; pigmented plate absent. Pharynx as in *S. schwetzi*. Wing : length 1·81 (1·74–1·91) mm.; width 0·37 (0·33–0·42) mm.; index 0·8 (0·6–1·1). Sixth abdominal tergite very large, 1·7 (1·5–1·8) times as long as fifth. Style half as long as coxite (fig. 2E), with two of spines at 0·9, and small ventral seta at 0·8 of the length of the style. Paramere blunt, and more truncated than that of *S. schwetzi*, its appearance varying according to position and the lower distal extremity sometimes appearing angular ; the hindmost of the longer hairs usually nearly as long as the next one. Aedeagus blunt and slightly curved. Penis filaments 3·4 times as long as pump.

S. murphyi is related to *S. schwetzi*, from which it may be distinguished in the male by the large sixth abdominal tergite and usually by the shape of the paramere.

Localities.—Gambia : Keneba, 2.xii.57 (*D. H. M.*), 5 ♀ paratypes. Nigeria : Kankiya, 11.ii.57 (*B. McMillan*), holotype ♂ and 1 ♂ paratype ; 27.iii.56 (*B. M.*) 1 ♂ paratype ; 12.ii.57 (*B. M.*), 1 ♂ paratype ; Lokoja, vii, viii.57 (*D. J. Lewis*), 2 ♂ paratypes. All these specimens are in the British Museum (Natural History). Other specimens seen but not measured : 39 ♂ from Keneba, Gambia, 1957 (*D. H. M.*) ; 2 ♂ from Bumbuna and 5 ♂ from Pepel, Sierra Leone, 1958 (*G. C.*). Among males of the complex examined from Kankiya and Lokoja the ratio of *schwetzi* to *murphyi* was 99 : 4 and 3 : 3 respectively.

Sergentomyia (*Parrotomyia*) *africana* ssp. *africana* (Newstead)

Phlebotomus africanus var. *niger* Parrot and Schwetz, 1937.
Sergentomyia africana Lewis and Kirk, 1960.

Distribution.—Agbor, 1928 (*V. B. W.*) ; R. Cross, 1906 (*R. W. G.*) ; Diko ; Funtua ; Gadau (Theodor, 1938) ; Ibadan (Theodor, 1938) ; Kaduna ; Kankiya ; Kano ; Katsina ; Lokoja, one with pollen grain on proboscis (*R. W. C.*) ; Makurdi ; Onitsha, 1910 (Newstead, 1912 ; Theodor, 1938 ; Kirk and Lewis, 1953) ; Yaba (*V. B. W.*).

Males, possibly of this form, were taken at Vom (*W. A. M.*).

Sergentomyia (*Parrotomyia*) *africana* ssp. *magna* (Sinton)

Phlebotomus africanus var. *sudanicus* Theodor, 1933.
Sergentomyia africana ssp. *magna* Lewis and Kirk, 1960.

Distribution.—Agbor (*V. B. W.*) ; Diko ; Gadau (Theodor, 1933, 1938) ; Kankiya ; Kano ; Katsina ; Kumba ; Lokoja ; Maiduguri (*T. A. M. N.*) ; Malumfashi ; Zaria.

Sergentomyia (*Grassomyia*) *squamipleuris* (Newstead)

Sergentomyia squamipleuris Theodor, 1958.

This common African species, which is often found in damp places in the Sudan, is relatively scarce at Kankiya in the dry northern region (Table I), and, although it is known from Lokoja, was not represented in a large catch made there mainly at light and mentioned later.

TABLE I.—*Phlebotomines from Kankiya. (The* P. dubosqi *and* rodhaini *were picked out of a total of some* 5,000)

	Females : percentage of all females from each site indicated					Percentage from all habitats	
	Tree holes	At light	Rodent holes	Ground squirrel holes	Ground squirrel shed	Females	Males
Phlebotomus dubosqi	.	.	1·1	.	.	0·71	0·12
P. rodhaini	.	.	.	.	.	.	0·12
Sergentomyia antennata	20·0	16·0	20·1	5·3	23·3	18·66	67·11
S. dubia	10·0	7·7	1·9	7·9	5·6	4·06	
S. bedfordi	.	20·9	15·1	27·6	16·7	15·95	
S. buxtoni	38·0	6·4	15·1	14·5	27·8	12·01	
S. schwetzi &/or *S. murphyi*	24·0	6·2	20·3	13·2	14·4	14·48	7·57
S. africana	.	1·8	0·4	.	.	0·77	0·18
S. africana magna	8·0	30·1	12·7	14·5	5·6	21·73	16·10
S. ingrami	.	0·2	.	.	.	0·12	0·06
S. dureni	.	0·4	.	.	.	0·18	.
S. squamipleuris	.	4·0	3·3	.	.	2·77	3·23
S. inermis	.	4·4	1·1	1·3	.	1·71	
S. adleri	.	0·2	4·2	5·3	6·7	3·30	1·89
S. clydei	.	1·8	4·9	10·5	.	3·59	3·60
TOTAL	50	455	851	76	90	1699	1639

Distribution.—Daudawa ; Diko ; Gadau (Theodor; 1938) ; Kaduna ; Kankiya ; Kano ; Katsina ; Lokoja (*R. W. C.*) ; Ugbobigha (*W. A. M.*) ; Yaba (*V. B. W.*) ; Yashi.

Sergentomyia (*Grassomyia*) *inermis* (Theodor)

Phlebotomus squamipleuris var. *inermis* Theodor, 1938.

This form occurs with *S. squamipleuris* in the Sudan (Kirk and Lewis, 1952), and Nigeria, without apparent intergradation, and we suggest that it should be regarded as a species.

Distribution.—Daudawa ; Gadau (Theodor, 1938) ; Kankiya ; Kano ; Katsina ; Zaria.

Sergentomyia (*Rondanomyia*) *ingrami* (Newstead)

Phlebotomus ingrami Newstead, 1914.

Distribution.—Daura ; Kaduna ; Kankiya ; Lokoja.

Sergentomyia (*Rondanomyia*) *decipiens* (Theodor)

Phlebotomus simillimus Adler, Theodor and Parrot, 1929.

One female without an abdomen, taken on the Cross River in 1906 and now in the British Museum, is probably this species.

Sergentomyia (*Rondanomyia*) *dureni* (Parrot)

Phlebotomus dureni Parrot, 1934.

Distribution.—Kaduna ; Kankiya ; Katsina ; Lokoja ; Makurdi.

Sergentomyia (*Sintonius*) *adleri* (Theodor)

Phlebotomus adleri Theodor, 1933.

Distribution.—Diko ; Gadau (Theodor, 1938) ; Kankiya ; Kano ; Katsina ; Maiduguri (*T. A. M. N.*) ; Zaria.

Sergentomyia (*Sintonius*) *affinis* ssp. *vorax* (Parrot)

Phlebotomus affinis Lewis and Kirk, 1940.

The females have about 80 teeth, as in the description by Parrot and Abonnenc 1951.

Distribution.—Diko ; Lokoja.

Sergentomyia (*Sintonius*) *clydei clydei* (Sinton)

Sergentomyia clydei Theodor, 1958.

The sixth abdominal tergite was examined in 16 males of *S. clydei* from Kankiya, and in two was found to be the same length as the fifth. One of these was an aberrant specimen rather like *S. adleri*, so there is only a single identified male which appears to represent *S. clydei clydei* at present in Nigeria.

Sergentomyia (*Sintonius*) *clydei* ssp. *latiterga* (Theodor)

Sergentomyia clydei latiterga Theodor, 1958.

Professor Theodor has informed me that this form was described from specimens from the Sudan. Its status requires further study because the position of two forms regarded as synonyms of the African *S. clydei*, namely *S. vaga* (Parrot) and *S. viator* (P. and M.), is uncertain. Subspecies *latiterga* is distinguished by the large size of the sixth abdominal segment of the male, and the most convenient measure of this is its length, which is, however, difficult to measure exactly. The pigmented part of the tergum does not correspond exactly with the tergite, and in distended specimens it is difficult to distinguish the point at which the tergite merges proximally and distally into thin cuticle. In ten Kankiya specimens measured, the length of the sixth tergite divided by that of the fifth ranged from 1·2 to 1·6 and averaged 1·4.

Many nematodes about 0·28 mm. long were found in the thorax and abdomen of a female from Kankiya.

Distribution of S. clydei (*including* latiterga).—Diko ; Kankiya ; Katsina; Lokoja ; Maiduguri (*T. A. M. N.*) ; Malumfashi.

Distribution

In general the known distribution of phlebotomines in Nigeria appears to accord with the pattern of distribution of the west African species given by Abonnenc and Larivière (1959).

Abonnenc (1959) and Abonnenc and Larivière (1959) have mapped the known distribution of *P. dubosqi*, and it is interesting to consider the record from Kankiya, a locality in the Sudan Savannah floral zone (Keay, 1953 ; Nigeria, Govt. of, 1956). South of 10° N. there are six records of *P. dubosqi*, and four of them are shown in Abonnenc's map. The one from Sierra Leone was made in the days when this genus was not well known, and is given with a question mark in Dalziel and Johnson (1915) ; the specimens are not known to exist now, and it seems unlikely that the species occurs there. There is a record from Bekwai in Ghana which Newstead (1912) doubted, and one from the River Cross, which appears to be incorrect, as indicated above. The most westerly definite record in this zone of latitude is from Togoland, and is in the " Ghana savanna gap ", described by Nash (1948), Rand (1951) and other authors,

where dry conditions extend southward to the coast and evidently enable this species, like *Glossina longipalpis* Wiedemann (Buxton, 1955), to approach it. The record from the Bangui area is near the northern limit of the Guinea forest, and the two eastern records are from dry country near Lake Rudolph. *P. dubosqi* is evidently a savanna species, and the Kankiya record is presumably near its southern limit in Nigeria, although a superficial inspection of the distribution map might suggest that it occurred further south.

The finding of *P. rodhaini* and *S. inermis* is of interest because they are not recorded from West Africa by Abonnenc and Larivière (1959).

It is interesting to know, not only that a species exists in a locality, but how numerous it is. The prevalence of several species at Kankiya is shown in Table I, and the percentages of each species among 215 females collected at light and on oiled paper traps at Lokoja in July and August, 1957, were : *S. antennata*, 6·1 ; *bedfordi*, 3·3 ; *simillima*, 28·4 ; *schwetzi* complex, 2·8 ; *africana africana*, 41·4 ; *a. magna*, 1·4 ; *collarti*, 0·9 ; *dureni*, 1·4 ; *affinis vorax* 13·7 ; *clydei*, 0·5.

Reference to Table I shows that the collections at Kankiya afford a striking example of a phenomenon familiar to students of the Phlebotominae, the finding of some species in very small numbers. It seems likely that such species are not really very scarce, and that the use of different collecting methods—based on knowledge of their habits—would extend their known distribution.

Habitat

Consideration of Table I, particularly the second and third columns of figures, shows that at Kankiya *P. dubosqi* and *rodhaini* were only found in the burrows of rodents, and that *S. buxtoni*, *schwetzi*, *adleri* and *clydei* tend to be relatively more numerous in them than in collections around lights, and that *S. dubia*, *bedfordi*, and *africana magna* are relatively numerous in the latter.

Deserted burrows appear to contain as many phlebotomines as occupied ones.

The Sex Ratio Among Caught Flies and the Identification of Males

The examination of the specimens recorded in Table I took a considerable time, and, like the figures obtained by Lewis and Kirk (1957), raises the question as to whether it is normally worth while to examine all specimens of both sexes of each species. The question seldom arises with collections of mosquitoes, tabanids and tsetse flies because either males are not collected in large numbers or those which are collected are easily identified without the necessity of making a microscopic preparation of each individual. Furthermore, the proportion of male mosquitoes or tsetse flies in a collection can yield useful biological information.

The student of the Phlebotominae to whom a large collection is submitted for examination may set out to examine all the specimens because much time and effort have been expended to assemble them. In the present instance the proportion of females varies somewhat among different species under various conditions but the information seems to be of little or no interest. Furthermore, the difficulty or impossibility of identifying the males of some species reduces the comparative value of results obtained for the others. As a normal procedure, it seems advisable to identify females only and to inspect the males quickly and store them for possible future reference, after using some to confirm the identification of certain females and picking out any species which are only represented by males.

Practical Significance

None of the phlebotomines known to be common in Nigeria bites man throughout its range, but several have been observed to do so in certain parts of Africa. The available information about phlebotomines biting or sucking blood in Nigeria is as

follows. A female of *S. bedfordi* was taken in a mosquito net at Kaduna but contained no blood. One of us (B. M.) caught a female of *S. schwetzi* at Diko, which was almost too distended to fly, and had probably bitten the collector. A record of this species biting at Ibadan has been mentioned above. At Kankiya a single blood-fed *S. africana africana* was seen (by B. M.) resting on the ear of a ground squirrel which it had probably bitten, although 15 others caught in the animal's shed contained nucleated blood. Simpson (1912) reported that *Phlebotomus* was troublesome at Onitsha, where *S. a. africana* has been found, but this observation has not been confirmed. *S. clydei* was seen to bite the ears of a dog at Kankiya.

Cutaneous leishmaniasis has been recorded from Northern Nigeria by Jelliffe (1955) and previous writers, and McMillan (1957) investigated an imported case and recorded *P. dubosqi* which, as in Niger Territory to the North, may be suspected to be the vector. Elmes and Hall (1944) referred to a few reports of kala azar but considered that they might be based only on clinical evidence.

The apparent unimportance of phlebotomines as a pest of man in Nigeria is perhaps of interest in relation to the absence or scarcity of kala azar.

Acknowledgments

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ON FOUR LITTLE KNOWN SPECIES OF *STENALIA* MULSANT FROM EAST AND SOUTH AFRICA (COLEOPTERA : MORDELLIDAE)[1]

By M. E. Franciscolo

(*Via Pagana Doria 10–4, Genoa, Italy*)

The present paper deals with three species of *Stenalia* Mulsant included in the key to the African species in the writer's *Monograph of the South African Mordellidae* (*South African Animal Life*, **4** : 207–291) but not fully described, as they belong to areas outside the scope of that work. The species in question are : *S. macrocephala* Franciscolo, 1957, *S. dollmani* Franciscolo, 1957, and *S. abyssinica* Franciscolo, 1957. Figures are also given of the genitalia of another species, *S. coeruleocephala* Ermisch, 1952, which have not yet been described.

Stenalia macrocephala Franciscolo

Stenalia macrocephala Franciscolo, 1957, *South African Animal Life* **4** : 245.

Dimensions : head 0·7 × 0·9 mm. ; pronotum 0·9 × 0·8 mm. ; elytra 2·3 × 0·8 mm. ; total length 3·9 mm. ; pygidium 0·9 × 0·5 mm.

General form slender, parallel-sided, elongate, not much attenuated posteriorly.

Pubescence ash-greyish, a little darker and opaque on distal part of elytra, black on pygidium.

Ground colour black ; antennae, palpi and buccal parts very dark brown, anterior femora brown, hind tibial spurs black.

Head robust, globular, broader than pronotum (as 9 : 8), convex ; occipital margin, seen from behind, with light concavity at middle ; seen from above, forming a regular and continuous curve, without abutments or protuberances at middle ; temporal angle behind eyes not well defined, temporal margin forming a broad and regular curve, merging with occipital margin ; no temporal edge between eyes and occiput, former extending to occipital margin. Eyes very finely granulated, glabrous, sub-circular. Upper surface of head with extremely fine, not dense, puncturation, interstices very glossy, with some iridescence. Maxillary palps and antennae shown in figures 10 and 5 respectively ; antennae rather short, if folded backwards hardly attaining anterior angle of pronotum.

Pronotum longer than wide (as 9 : 8), greatest width at level of distal third, strongly sinuate at sides before basal angles ; surface very broadly and deeply file-sculptured, interstices with very obvious transversely arranged shagreen ; iridescence as in head, but here much brighter ; anterior margin with moderately developed medial lobe, not sinuate at sides, in lateral view appearing uniformly concave between anterior and posterior angles ; anterior angles convex (about 110°) and broadly smoothed out at vertex ; basal angles perfectly square, with sharp vertex, basal lobe broad, tip flat and feebly emarginated.

Scutellum small, triangular, black, covered by same ash-greyish pubescence as other surrounding surfaces.

Elytra 2·7 times as long as their combined width at base, as broad as base of pronotum ; parallel-sided, apices strongly acuminate ; surface bearing same type of sculpture as pronotum, but transversely shagreened interstices opaque and without any obvious sheen. Epipleura extremely thin at base, not visible at level of hind margin of metacoxae. Metepisterna typically stenalioid, short, broad, with metasternal side strongly convex, epipleural side moderately concave, mesosternal side almost three times as broad as metacoxal one ; pubescence covering metepisterna ash-greyish, as is that of all other surfaces on underside. Metacoxa glossy, almost without sculpture, all other surfaces strongly and densely file-sculptured with heavily shagreened interstices.

Ratio of abdominal sternites : 15 : 15 : 16 : 14 : 34.

Hypopygium almost 2·5 times as long as 4th abdominal sternum. Pygidium unusually slender and long for *Stenalia*, twice as long as hypopygium, completely covered by dark and rough

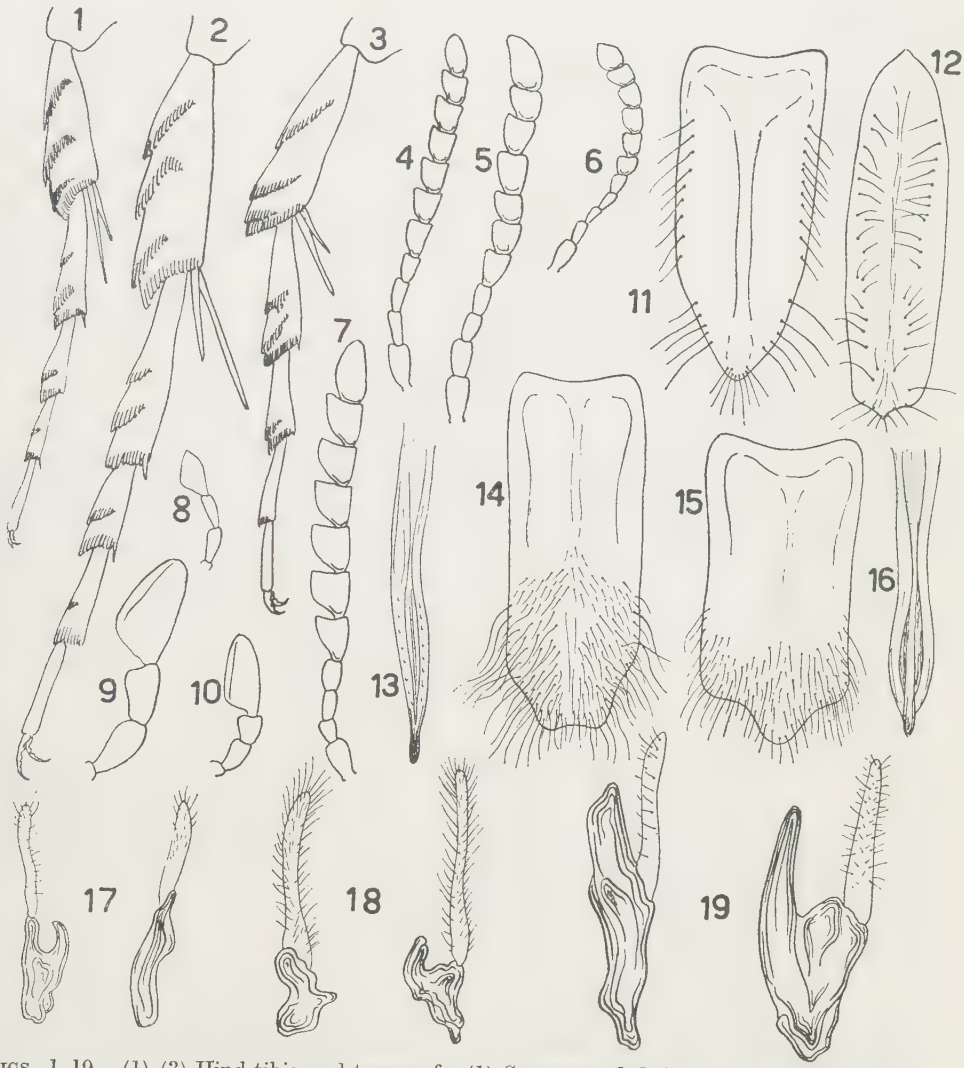
[1] Contribution No. 41 to the knowledge of Mordellidae.

pubescence, perfectly straight, apex acuminate, lateral grooves clearly visible almost up to apex; seen laterally, appearing extremely thin and sharp in distal part.

Genitalia of the unique male specimen could not be studied.

Legs conforming to basic generic pattern; anterior and middle tarsi with penultimate segment not dilated, very feebly excised at tip; hind legs (fig. 1) with both tibial spurs black, inner almost twice as long as outer, much shorter than first hind tarsal segment. Tarsal ratios: anterior 11½: 6 : 5 : 4 : 6; middle 18 : 12 : 5 : 5 : 8; posterior 22 : 14 : 13 : 14.

N. W. Rhodesia: Mwengwa. Type: 1 ♂ labelled "N.W. Rhodesia, Mwengwa, 27° 40′ E., 13° S., in long grass, 4.iv.1914, H. C. Dollman, Coll. C. Dollman 1919–79" in the British Museum (Nat. Hist.).



Figs. 1–19.—(1)–(3) Hind tibia and tarsus of: (1) *S. macrocephala* Franciscolo; (2) *S. dollmani* Franciscolo; (3) *S. abyssinica* Franciscolo. (4)–(7) Antennae of: (4) *S. coeruleocephala* Ermisch; (5) *S. macrocephala*; (6) *S. abyssinica*; (7) *S. dollmani*. (8)–(10) Maxillary palp of: (8) *S. abyssinica*; (9) *S. dollmani*; (10) *S. macrocephala*. (11) Eighth urosternite of *S. coeruleocephala*. (12) Ninth urosternite of *S. dollmani*. (13) Distal part of penis, *S. dollmani*. (14)–(15) Eighth urosternite of: (14) *S. dollmani*; (15) *S. abyssinica*. (16) Distal part of penis, *S. abyssinica*. (17)–(19) Parameres of: (17) *S. abyssinica*; (18) *S. dollmani*; (19) *S. coeruleocephala*.

Affinities.—Within the group of completely black species of *Stenalia* from Africa, *macrocephala* Franc. and *corvina* Ermisch (the latter from Upemba National Park) are the only ones having the head broader than the pronotum ; on the other hand, *macrocephala* Franc. has the unique feature of the extremely slender and parallel-sided form, and the sharp, thin and elongate pygidium ; these two characters taken together give *macrocephala* Franc. the appearance of a *Mordellistena* rather than of a *Stenalia*.

Stenalia abyssinica Franciscolo

Stenalia abyssinica Franciscolo, 1957, *South African Animal Life* **4** : 246.

Dimensions : head 0·8 × 1·0 mm. ; pronotum 1·15 × 1·1 mm. ; elytra 2·6 × 1·0 mm. ; total length 4·55 mm. ; pygidium 1·3 × 0·5 mm.

General form convex, short, strongly attenuated posteriorly.

Ground colour dark brown ; elytra testaceous, with narrow basal band, suture and apices dilutely brown ; all buccal parts, antennae, anterior and middle legs reddish-brown ; posterior legs, including tibial spurs, dark brown.

Pubescence golden, intensely bright, particularly on testaceous surfaces of elytra.

Head moderately convex, narrower than pronotum (as 10 : 11) ; occipital margin, seen from behind, with only feeble concavity at middle ; seen from above, without any trace of medial abutments or lobe ; temporal angle extremely broad and completely smoothed out at vertex, temporal edge reduced to an extremely thin surface behind eyes, latter extending to occipital margin ; eyes sub-elliptical, very finely granulated and completely glabrous. Upper surface of head with very sparse and light puncturation, with no trace of shagreen in the interstices, without any sheen. Maxillary palpi and antennae shown in figures 8 and 6 respectively ; antennae, folded backwards hardly reaching occipital margin of head.

Pronotum strongly convex, hardly longer than broad (an unusual feature in *Stenalia*) ; anterior lobe almost entirely obsolete, anterior margin forming rather broad and continuous curve ; anterior angles broadly convex (about 125°), and completely smoothed out at vertex ; sides seen laterally, perfectly concave between anterior and basal angles. Basal angles moderately convex (about 100°), not very sharp at vertex ; basal lobe broad, with broad sides and flat tip, slightly emarginate at middle. Seen from above, pronotum with considerable sinuosity at sides before basal angles. Surface densely and deeply file-sculptured, with transversely shagreened interstices, without iridescence ; pubescence of pronotum much longer, brighter and thicker than that of head.

Scutellum triangular, densely covered by whitish long pubescence, contrasting to some extent with that of elytra.

Elytra 2·5 times as long as their combined breadth at shoulders ; rather convex, abruptly attenuated posteriorly. Surface very finely and densely file-sculptured, with transversely shagreened interstices, bright, with some iridescence. Apices are very broadly and separately rounded. Epipleura extremely narrow at base, completely hidden at level of the mesosternal-metacoxal suture. Metepisterna broad, short, convex at metasternal side, mesosternal side 2·5 times as long as metacoxal side ; pubescence same colour as on other surrounding surfaces ; underside densely file-sculptured, with rugulose shagreen.

Ratio of abdominal sternites 9 : 5 : 9 : 13 : 20.

Pygidium only 1·6 times as long as hypopygium, stout and obtuse, densely covered by rough, brown pubescence ; seen laterally, appearing abruptly flattened at apex ; lateral grooves completely obsolete at about middle.

Parameres (fig. 17) typical of species of the group *brachyptera* Franciscolo (Cape Province) ; penis and eighth internal urosternite represented in figures 16 and 15 respectively.

Legs : penultimate segment of anterior and middle tarsi only slightly broader than onychium, narrowly emarginate almost to middle. Posterior legs represented in figure 3. Hind tibial spurs dark brown, inner almost twice as long as outer, hardly shorter than first hind tarsal segment. Tarsal ratios : anterior 14 : 7 : 5 : 6 : 7 ; middle 22 : 10 : 7 : 6 : 7 ; posterior 28 : 17 : 17 : 14.

ABYSSINIA. Type, 1 ♂ labelled " Abyssinia, 76–36 " in the British Museum (Nat. Hist.).

Affinities. The species most similar to *abyssinica* is *karossiana* Franciscolo (from Kaross, in S. W. Africa); it differs from all species having coloured elytra and the pronotum longer than broad in its short pygidium, relatively short elytra (only 2·5 times as long as their combined breadth at base) as well as in the hind tarsal ridge formula and ridge arrangement. It is furthermore the only African species known so far having the membranous appendages of the parameres as long as their sclerotised basal piece (usually, the appendage is twice as long, or definitely shorter than the basal piece).

Stenalia dollmani Franciscolo

Stenalia dollmani **Franciscolo, 1957, *South African Animal Life* 4 : 247.**

Average dimensions: head 1·0 × 1·25 mm.; pronotum 1·51 × 1·4 mm.; elytra 3·7 × 1·7 mm.; total length 6·21 mm.; pygidium 1·25 × 0·5 mm.

General form robust, convex, strongly dilated at level of pronotum, abruptly narrowed posteriorly.

Colour black, elytra reddish-brown, except for a narrow periscutellar area, suture, epipleural sides and apices, which are all dark brown; antennae, mouth parts and legs blackish; hind tibial spurs black.

Pubescence uniformly distributed, with intense cupreous sheen on upper surface, definitely silvery underneath.

Head slightly shorter than broad (as 5 : 6); occipital margin, seen from behind, appearing perfectly straight without usual medial concavity, seen from above, appearing broadly convex with slight abutment in middle; temporal margin below and behind eyes broadly convex, without any distinct temporal angle; temporal fringe unusually developed; tempora reduced to very narrow edge, eyes almost extending to occiput; eyes very sparsely and irregularly pubescent, particularly around temporal circumference, finely granulated, subcircular. Sculpture of head consisting of fine and regularly arranged puncturation, with glossy interstices; surface intensely shining, with some blue reflections under certain lights. Maxillary palpi and antennae of male shown in figures 9 and 7, respectively; antennae reaching anterior angle of pronotum when folded backwards.

Pronotum considerably convex, longer than wide (as 8 : 7), maximum width at middle; sides, seen laterally, perfectly concave between anterior and basal angles, seen from above, appearing strongly convex in anterior half, then abruptly attenuated to basal angles; anterior angles moderately convex (about 115°), narrowly smoothed out at vertex; basal angles slightly acute, rather sharp at vertex. Base bearing broad medial lobe, almost completely rounded off at tip without any medial emargination. Sculpture lightly impressed, of usual file type, without any visible shagreen at centre, but roughly rugulose-strigated along all marginal areas; blue iridescence still fairly intense.

Scutellum small, triangular, covered by same pubescence as that of surrounding surfaces.

Elytra 2·7 times as long as their combined breadth at shoulders; at base as broad as base of pronotum, rather convex, abruptly narrowed in distal third, apices narrowly and separately rounded; sculpture of file type with very delicate, transversely arranged shagreen. Epipleura only about one-fourth as broad as maximum width of metepisterna, becoming completely concealed at level of hind margin of metacoxae. Metepisterna with mesosternal side only twice as broad as metacoxal side, metasternal side moderately convex, covered by intensely bright, silvery pubescence, identical to that of other surfaces of underside. Metacoxae bearing at middle, amongst silvery pubescence, a longitudinal stripe of copper-coloured hairs, which is rather unusual.

Base of abdominal sternites covered by silvery hairs, gradually darkening towards margins; ratio : 10 : 10 : 13 : 13 : 24.

Genitalia: the parameres (fig. 18) both with extremely long membranous dorsal appendage, exactly 3 times as long as sclerotised basal piece. Penis, eighth and ninth internal urosternite represented in figures 13, 14 and 12 respectively.

Legs: anterior and middle tarsi with penultimate segment hardly wider than third; very broadly emarginate (the emargination affecting only distal fourth of segment); hind legs repre-

sented in figure 2 ; black hind tibial spurs very unequal, inner being one and two-thirds as long as outer, definitely shorter than first hind tarsal segment. Tarsal ratios : anterior 12 : 9 : 8 : 6 : 11 ; middle 24 : 12 : 10 : 8 : 10 ; posterior 30 : 18 : 18 : 15.

N.W. Rhodesia : Mwengwa. Holotype ♂, allotype ♀ and 4 cotypes labelled " N.W. Rhodesia, Mwengwa, 27° 40′ E., 13° S., H. C. Dollman " with the following collecting dates : 30.vi.13, 16.i.13, 6.iv.14, 6.viii.13, 23.ii.13 ; another specimen, doubtfully referable to this species (it is severely damaged) is labelled " N.W. Rhodesia, Livingstone, Zambezi Riv., 28.ii.13." All specimens in the British Museum (Nat. Hist.) (all with label " ex. Coll. H. C. Dollman, B.M. 1919–79 ").

Affinities.—S. dollmani Franciscolo and *turneri* Franciscolo (the latter from Cape Province, Queenstown) are the only two African species of the group with coloured elytra that have strongly dentate antennae ; the two species differ from one another mainly in the form of the basal angles of the pronotum (acute in *dollmani*, definitely obtuse in *turneri*) ; the extreme length of the dorsal appendages of the parameres clearly separates *dollmani* from any other species known of the genus, even outside Africa.

Stenalia coeruleocephala Ermisch

Stenalia coeruleocephala Ermisch, 1952, *Ann. Mus. Congo belge* 8vo **22** : 41.

In the large amount of material in the British Museum (Nat. Hist.) so far examined for the preparation of the *Monograph of the South African Mordellidae*, there is a male specimen of this important species, labelled " Zanzibar, Frei Coll., B.M. 1905–100 ". *S. coeruleocephala* does not belong, so far, to the South African fauna ; its type is from Upper Uellé River (Moto). I take this occasion to figure the antennae (fig. 4), the eighth urosternite (fig. 11) and the parameres (fig. 19) of this species, to facilitate its recognition. It will be noted that in the structure of the parameres, *coeruleocephala* seems to be closely allied to *S. australis* Franciscolo (Natal) and *S. occidentalis* Franciscolo (Senegal).

FLEAS FROM MACQUARIE ISLAND, WITH A DESCRIPTION OF A NEW SPECIES OF *PARAPSYLLUS* ENDERLEIN

By G. M. Dunnet

(*Natural History Department, University of Aberdeen, Scotland*)

[Communicated by Mr. F. G. A. M. Smit]

Through the kind co-operation of Mr. P. G. Law, Director of the Antarctic Division, Department of External Affairs, Melbourne, I was able to visit Macquarie Island with the Australian National Antarctic Research Expedition's relief ship in December, 1957, in order to collect fleas from the various species of birds which breed there. The A.N.A.R.E. have a permanently manned scientific observatory on the island and I am further indebted to Mr. Law for the facilities of this Station and to Dr. Robert Carrick, Wildlife Survey Section, C.S.I.R.O., Canberra, for arranging my passage.

Macquarie Island is a subantarctic island lying in latitude 54½° S., just north of the antarctic convergence. It is ice-free, though snow may lie on the higher areas for long periods during the winter (Law and Burstall, 1956). There is a rich and varied herbaceous vegetation (Taylor, 1955) and the island has large numbers of breeding birds and seals from spring to autumn (September to April), but only a few species remain throughout the winter. Over 30 species of sea birds, including 4 breeding species of penguins, occur on the island.

This is a very isolated island, being 800 miles south-east of Tasmania, 650 miles south-west of New Zealand with the Auckland Islands (350 miles) and Campbell Island (400 miles) lying between, and about 900 miles from the Antarctic continent. It is the southernmost and westernmost of the group of New Zealand subantarctic islands, and the nearest land to the west are the Kerguelen Islands and Heard Island, approximately 3000 miles away. As very little indeed is known about the Siphonaptera of the subantarctic islands in the New Zealand area, the fleas of Macquarie, the island lying nearest to the southern Indian Ocean islands whose flea fauna is better known, are of particular interest.

De Meillon's useful review (1952) of the distribution of fleas of sea birds in the southern oceans summarises all the information available at that time. Since then an important paper has been published by Smit (1957) giving additional records from Kerguelen and Amsterdam Island, and a very interesting record from Antipodes Island. This last is the only fully documented published flea record from any of the New Zealand group of subantarctic islands. There is only one published record of a flea from Macquarie Island, and this is *Parapsyllus magellanicus heardi* de Meillon, but the host, date, and place are unrecorded (de Meillon, 1952).

Nests were collected in the field and placed in polythene bags which were then sealed. They were examined on board ship on the return journey and fleas were transferred to vials of 70 per cent. alcohol. A list of the nests examined is given in Table I. In addition, four specimens of *Rattus rattus* (L.) were trapped in the Station and from them one female *Nosopsyllus fasciatus* (Bosc) was obtained. A complete list of the flea collection is given in Table II.

TABLE I.—*Lists of nests examined for fleas, and details of the type of nest*

Species	Type of nest	Altitude (ft.)	Number examined	Fleas present
Pygoscelis papua (Forster) . . Gentoo Penguin	Large grassy nest in open	50	6	No
Eudyptes cristatus (Miller) . . Rockhopper Penguin	Cup of small stones and some dry grass. Open	20	6	Yes
Eudyptes schlegeli Finsch . . Royal penguin	Shallow scrape lined with small stones or sand. Open	50	*ca.* 50 in several rookeries	No
Diomedea exulans Linnaeus . . Wandering Albatross	Large, open, grassy and mossy nest	*ca.* 10	1	,,
Diomedea melanophris (Temminck) Black-browed Albatross	Large, open, grassy, on grassy cliff	150	3	,,
Phoebetria palpebrata (Forster) . Light-mantled Sooty Albatross	Large, open, muddy cup	150	3	,,
Macronectes giganteus (Gmelin) . Giant Petrel	Large, open, grassy	400	6	Yes
Pterodroma lessoni (Garnot) . . White-headed Petrel	Grassy nest in long underground burrow	*ca.* 400	10	,,
Puffinus griseus (Gmelin) . . Sooty Shearwater	Ditto	*ca.* 400	1	,,
Pachyptila desolata (Gmelin) . . Dove Prion	,,	*ca.* 400	6	,,
Larus dominicanus Lichtenstein . Dominican Gull	Open, grassy, on rocky stack	10	1	,,
Catharacta skua lönnbergi (Mathews) Southern Skua	Open, grassy, and mossy	400	1	No
Phalacrocorax albiventer purpurescens Brandt Macquarie Is. Blue-eyed Cormorant	Open, grassy, on rocks	10	8	,,

Parapsyllus magellanicus heardi de Meillon, 1952

One hundred and forty-six males and 63 females of this species were obtained, and the flea was very numerous in some nests of the Rockhopper Penguin, particularly in those without much lining, where they were quite visible among the small stones in the cup of the nest. The species was also found, in small numbers, in the underground nests of the White-headed Petrel. These specimens are indistinguishable from those taken from a variety of flying sea birds on Heard Island and the Kerguelen Islands (where the flea was also numerous in a nest of the Rockhopper Penguin), about 3000 miles to the west (de Meillon, 1952 ; Smit, 1957), and the same sub-species has been recorded from the Macaroni Penguin, *Eudyptes chrysolophus* Brandt, on Marion Island in the south Indian Ocean, about 1500 miles west of Kerguelen (de Meillon and Hardy, 1953).

Parapsyllus cardinis sp. n.

Type material : Holotype ♂, allotype ♀, and 58 ♂, 58 ♀ paratypes from top of Mawson Pt., 16.xii.1957, from nest of *Pterodroma lessoni* (Garnot) ; 2 ♂, 3 ♀ paratypes from Aurora area, 16.xii.1957, from nest of *P. lessoni* ; 4 ♂ paratypes from summit of Mawson Pt., 16.xii.1957, from nest of *P. lessoni* ; 1 ♀ paratype from edge of plateau, near south side of Flat Creek, 16.xii.1957, from nest of *P. lessoni* ; 8 ♂, 11 ♀ paratypes from plateau, Douglas Pt., 15.xii.1957, from nest of *P. lessoni* ; 12 ♂, 19 ♀ paratypes from Douglas Pt., 15.xii.1957, from nest of *P. lessoni* ; 1 ♂, 1 ♀ paratypes from south side of Flat Creek, ¾ mile from sea, 16.xii.1957, from nest of *Pachyptila desolata* (Gmelin) ; 1 ♀ paratype from Mawson Pt., 16.xii.1957, from nest of *Macronectes giganteus* (Gmelin).

Diagnosis: The new species differs strikingly from the three hitherto known species of the genus (*P. longicornis* (Enderlein, 1901), *P. magellanicus* J., 1938, and *P. taylori* J., 1942) in the male by the remarkable development of sternum IX and

TABLE II.—*Complete list of the flea collections*

ex *Pterodroma lessoni* (nest)				
Coll. No. . .	433	2 ♂	3 ♀	*Parapsyllus cardinis*
		10 ♂	11 ♀	*Notiopsylla enciari*
	438	.	1 ♀	*Parapsyllus magellanicus heardi*
		4 ♂	.	*Parapsyllus cardinis*
	439	.	1 ♀	*Parapsyllus cardinis*
		.	3 ♀	*Notiopsylla enciari*
	441	.	2 ♀	*Parapsyllus magellanicus heardi*
		8 ♂	11 ♀	*Parapsyllus cardinis*
		1 ♂	3 ♀	*Notiopsylla enciari*
	442	1 ♂	.	*Parapsyllus magellanicus heardi*
		12 ♂	19 ♀	*Parapsyllus cardinis*
		1 ♂	5 ♀	*Notiopsylla enciari*
	443	1 ♂	3 ♀	*Parapsyllus magellanicus heardi*
		59 ♂	59 ♀	*Parapsyllus cardinis*
		1 ♂	.	*Notiopsylla enciari*
	446	.	1 ♀	*Parapsyllus magellanicus heardi*
		2 ♂	2 ♀	*Parapsyllus cardinis*
ex *Pachyptila desolata* (nest)				
Coll. No. . .	434	.	1 ♀	*Notiopsylla* sp.
	436	1 ♂	1 ♀	*Parapsyllus cardinis*
	444	.	4 ♀	*Notiopsylla kerguelensis*
	447	6 ♂	16 ♀	,, ,,
ex *Puffinus griseus* (nest)				
Coll. No. . .	437	3 ♂	11 ♀	,, ,,
ex *Macronectes giganteus* (nest)				
Coll. No. . .	445	.	1 ♀	*Parapsyllus cardinis*
ex *Larus dominicanus* (nest)				
Coll. No.	449	1 ♂	.	*Notiopsylla kerguelensis*
ex *Eudyptes cristatus* (nest)				
Coll. No. . .	435	4 ♂	3 ♀	*Parapsyllus magellanicus heardi*
	440	137 ♂	53 ♀	,, ,, ,,
ex *Rattus rattus* (body)				
Coll. No. . .	449	.	1 ♀	*Nosopsyllus fasciatus*

the presence of an anteroventral lobe of the apodeme of tergum IX, and in the female by the large number (40–45) of short stout genital setae on the inner side of tergum VIII (small numbers of these setae are present in the other species as follows: 6–13 in *P. longicornis* sspp., 15–16 in *P. magellanicus* sspp., and 12–14 in *P. taylori*). In addition, the posterior margin of the mid and hind tibia has seven setal notches as compared with six in the other species. As in *P. magellanicus*, but not the others, the mesonotum has pseudosetae under the collar. The longest seta of the antennal pedicel reaches to half to two-thirds the length of the club in the male, and to near the apex of the club in the female. These setae are very short in *P. magellanicus* and *P. taylori*, reaching at most to the ventral margin of the third claval segment, while in *P. longicornis* they extend to near the apex of the club in the male, and beyond the club in the female. The genal process is rather large, having 8–10 ventral setae, compared with the smaller process (smallest in *P. longicornis*) and 4–7 setae of the other species.

Head: first frontal row well developed, consisting of 5 or 6 longish setae and an upper short one; second frontal row consists of 2 long setae in front of the conspicuous ventrally sinuate eye, and a third near the ventral margin of the head. Genal process quite large, with a row of 8–10 setae along its ventral margin. Occiput with three rows of setae, the first with 3–4 setae on each side, the second of 2 longish ventral setae and sometimes 1 or 2 smaller setae above them, on each

FIGS. 1, 2.—*Parapsyllus cardinis* sp. n., male : (1) terminalia of holotype; (2) phallosome of paratype.

side, and the third (submarginal) row of 5 setae on each side. Labial palp 5-jointed, the fifth segment as long as the third and fourth together, and reaching to a little beyond the middle of the fore trochanter. The longest setae of the antennal pedicel reach one half to two-thirds along the club in the male and to the apex of the club in the female.

Thorax : pronotum with 2 rows of setae, the first being represented by only 2–3 small setae on each side, the second a well-defined row of long setae. Mesonotum with 3 distinct rows, the anterior being represented by only a few small dorsal setae, and the posterior with several long setae. Metanotum as mesonotum, but the anterior row is represented by only one or two very small setae on each side. (*P. magellanicus* also has 2 rows of setae on the nota, but there is only 1 well-defined row in the other two species.) Metepisternum and metepimeron as in the other species ; the latter with 2 vertical rows of 3–5 long setae.

Legs : mid and hind tibia each with 7 notches in posterior (dorsal) margin, with 2 stout setae inserted in each notch except the apical one which has 3, and the third from the base (which is absent in the other species of the genus) sometimes has only one. Longest seta of second hind tarsal segment reaches to about the middle of segment 4, as in *P. longicornis*, and the fifth tarsal segment has 4 pairs of lateral plantar setae, 2 pre-apical plantar setae and a few (2 or 3) smaller setae on the plantar surface.

Abdomen : terga II–VII with 2 rows of setae and circular spiracular fossae.

Terminal segments—Male (fig. 1) *:* apodeme of sternum IX with conspicuous anteroventral lobe, about half as large as the sensillum in side view. Manubrium long and broad, curved upwards, with strong dorsal margin. Body of clasper broadly conical, with a ventral patch of about 12 setae anterior to the acetabulum, and posteriorly and dorsally with about 40–50 long marginal and submarginal setae, and about 10–12 setae on inner side of dorsal area. Moveable process long and narrow, with a rounded tip bearing 6–8 short setae.

Proximal arm of sternum IX slender with an apparent constriction just dorsal to its junction with the distal arm. Anterior end of distal arm broad, and anteroventral area fashioned into a conspicuous strongly sclerotised socket, which engages ventrally with a conspicuous strengthened knob rising from sternum VIII. Posteriorly, sternum IX narrows gradually and then flattens out into a thin plate above and below a strong central rod, which extends to about one-fifth the length of the arm from the posterior tip. Distal arm ends in quite a sharp upturned point, bearing about 30 slender downward-pointing setae. On ventral margin of central rod on inner side of distal arm are situated 12–14 evenly spaced long slender setae.

Sternum VIII large and with only 2 patches of bristles—a group of 2–5 small slender setae in the mid-ventral region, and a conspicuous vertical submarginal row of 4–7, usually 6, long setae. From the ventral surface rises the strongly chitinised knob associated with the socket on sternum IX.

Phallosome (fig. 2) extends anterior to manubrium, and longest of aedeagal tendons curve anterior to the aedeagal apodeme. Structure of aedeagus quite characteristic.

Female (fig. 3) : posterior margin of sternum VII has no sinus, but forms only a slightly developed lateral lobe. A conspicuous row of 6 long setae present in mid-ventral area, and another 5–9 setae anterior to this row.

Sternum VIII a small longish sclerite, overlapped completely by sternum VII and tergum VIII.

Tergum VIII large, bearing posteriorly and on its inner side a dense patch of 40–45 short stout genital setae, and on outer side 25–30 long slender curved marginal and submarginal setae. Anteriorly the sclerite bears *ca.* 25–28 long setae.

Anal tergum and sternum prominent, each with numerous setae. Stylet small, about 2–2·5 times as long as broad in the middle.

Spermatheca has a relatively small and almost triangular bulga and a very long (thrice the bulga) hilla of varying width in different individuals. Duct of bursa copulatrix long and curved (fig. 3).

Length : ♂, 2·5–2·9 mm. ; ♀, 2·8–3·3 mm.

Remarks.—Obviously a true parasite of the White-headed Petrel, rather scarce on the Dove Prion and absent from the only nest of the Sooty Shearwater which was obtained. Its occurrence on the non-burrowing Giant Petrel is surprising. Like *P. taylori* which parasitises the shearwaters *Puffinus tenuirostris* (Temminck), and *P. pacificus* Gmelin, and the Storm Petrel, *Pelagodroma marina* Latham, around the

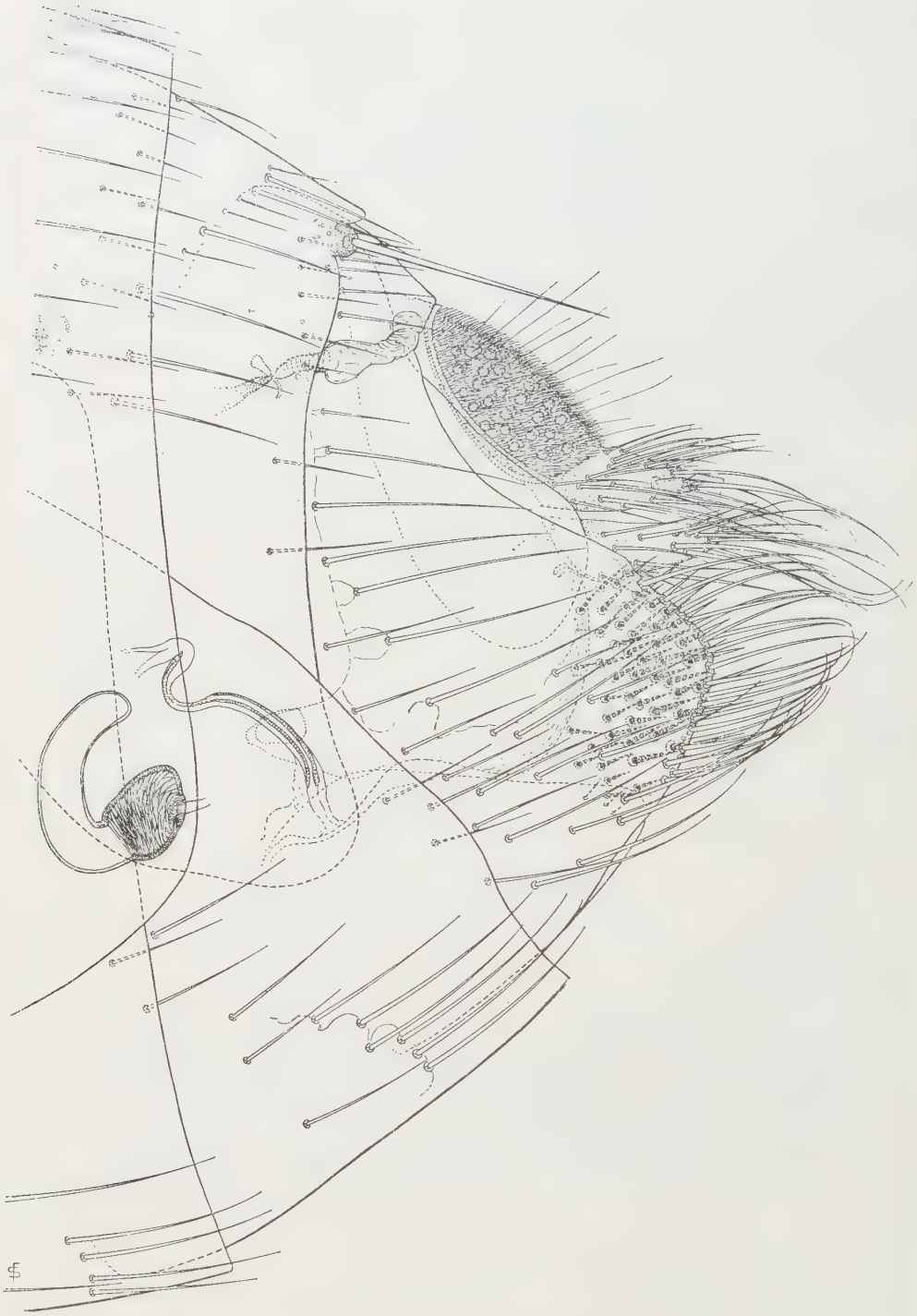


Fig. 3.—*Parapsyllus cardinis* sp. n.: terminalia of female allotype.

southern coast of Australia (*unpublished data*), this species is a parasite of flying and widely dispersing birds, while the other two species of *Parapsyllus* are primarily associated with penguins.

Notiopsylla kerguelensis (Taschenberg, 1880)

Ten males and 31 females of this flea were found, mainly in nests of the Dove Prion and Sooty Shearwater, but one specimen came from the nest of a Dominican Gull. None was found in nests of the White-headed Petrel. This flea has previously been recorded from various burrowing petrels, the Giant Petrel, and the Dominican Gull from South Georgia, Kerguelen Islands, and Heard Island and the records are summarised by Smit (1957). Its occurrence on Macquarie extends its known range 3000 miles to the east.

Notiopsylla enciari Smit, 1957

A fine series of 13 males and 25 females of this species, previously known from only one male and one female from the almost flightless parakeet *Cyanoramphus unicolor* (Lear) on Antipodes Island, was obtained from nests of the White-headed Petrel. This flea is very similar to *N. kerguelensis* ; the difference in the shape of the frons, suggested by Smit (1957) to be diagnostic, is not completely constant. The other characters are good, however, particularly the numbers and size of the marginal tergal spinelets, and males may easily be distinguished by the aedeagus and sternum IX, and females by the shape of the hilla of the spermatheca and by the shape of the lobe below the sinus in the posterior margin of sternum VII, though this lobe is not always as pointed as shown in Smit's figure.

As Smit (*loc. cit.*) points out, it is not known if, on Antipodes Is., this flea is found only on *Cyanoramphus unicolor*, and it may occur on other birds there, and be associated with the parakeet only accidentally. However it is of interest to note that Macquarie Island, too, had a flightless parakeet *C. novaezealandiae erythrotis* (Wagler), which is now extinct, and the presence of *N. enciari* on the island may be associated with this.

Nosopsyllus fasciatus (Bosc, 1800)

Only one female of this species was obtained from the rats introduced to the island by sealers in the last century.

Acknowledgment

I should like to thank Mr. F. G. A. M. Smit, of the British Museum (Nat. Hist.) at Tring, for his very generous assistance in the preparation of this paper. He checked all the material, drew the excellent figures of the new species, and gave many helpful comments on the manuscript.

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TWO NEW EUROPEAN SPECIES OF *APANTELES* (HYMENOPTERA: BRACONIDAE)

By G. E. J. Nixon

(*Commonwealth Institute of Entomology, London.*)

Subfamily Microgasterinae

Apanteles lemariei sp. n.

Female.—Blackish with the gaster slightly paler. Stigma uniformly pale brown and without trace of a basal spot. Hind femora yellowish with frequent apical and basal infuscation; this infuscation sometimes extends along upper surface of femur.

Antenna very slightly tapered apically and with the preapical segment about one and one third times longer than wide.

Mesoscutum weakly shining and with only an extremely superficial punctation. Scutellum flattened and with only the merest trace of punctation; lateral, excavate area (fig. 2). Propodeum shining and almost smooth. Suture between scutellum and mesoscutum reduced to a very fine groove whose foveation is hardly noticeable at ×40. Metapleura and hind coxa shining, almost smooth.

Gaster (figs. 4 and 5); tergite 1 smooth, unsculptured except for traces of punctation laterally where it turns over; median field of tergite 2 virtually smooth but with faint satin-like sheen. Ovipositor sheaths extremely short (fig. 4); ovipositor itself very thin and sharply downcurved at apex (fig. 4).

Male.—Like female except that the legs tend to be darker and tergite 1 is slightly narrowed behind.

Length: ♂ ♀, *ca.* 3 mm.

Czechoslovakia: Bzenec, 10 ♀ (one ♀, the type, 15.vii.1957), 7 ♂, bred vi–vii, 1956–57, ex *Heringia dodecella* L. (*J. Lemarie*); Vracov, 3 ♀, 3 ♂, bred vi–vii, 1956–57, ex *H. dodecella* L. (*J. Lemarie*). Type in Coll. Capek.

On the absence of a propodeal areola, the shape of the basal tergites and on its exserted ovipositor, this species falls naturally into Wilkinson's group U. Within this group it is distinguished from all other European species known to me by the shortness of the ovipositor. The species it most closely resembles seems to be *gracilariae* Wilk., but *gracilariae* has the suture between mesoscutum and scutellum distinctly deepened medially and wider here with more distinct foveation; the median field of tergite 2 is more transverse and the ovipositor is thicker, downcurved throughout and with longer sheaths. Also, the antenna of *gracilariae* is shorter than in *lemariei* and the ocelli are in a lower triangle.

Apanteles tedellae sp. n.

Male and Female.—Blackish with gaster a little paler and tergite (2 + 3) sometimes yellowish at sides; beneath, the gaster is extensively yellow on basal half and the hypopygium is transparent yellowish in greater part. Legs predominantly bright yellowish; hind coxae brown, though yellowish beneath towards apex; hind tibia weakly infuscate at apex; hind tarsus similarly infuscate.

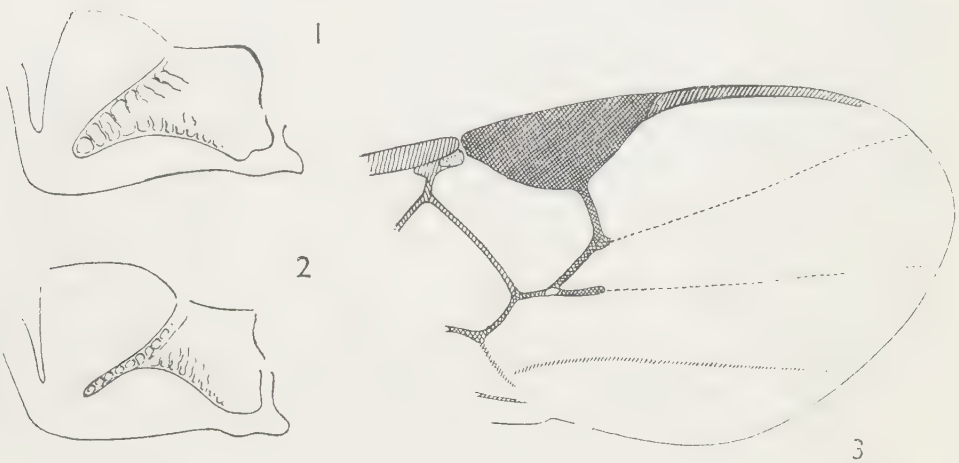
Female.—Posterior tangent to the anterior ocellus hardly touching the posterior ocelli. Face below with some vague punctation that becomes more distinct on the yellowish clypeus. Antenna rather short, decidedly bristly and with the preapical segment about one and one third times longer than wide.

Mesoscutum uniformly smooth, shining, with faint satin-like sheen and virtually impunctate except towards anterior, declivous part. Lateral, polished field of scutellum not extensive, the

sunken area above it in greater part smooth (fig. 1). Propodeum shining, smooth except for a few vague rugulosities around the posterior orifice. Legs rather thick, inner spur of hind tibia noticeably longer than outer one. First transverse cubitus as long as, or even slightly longer than, the first abscissa of the radius, the two veins forming a well marked stub at their junction (fig. 3)

Gaster (figs. 6 and 7) : tergite 1 gradually narrowed from base to apex, finely rugulose aciculate along sides and with broad, almost smooth strip along the middle ; this strip hardly extends onto the rugose, horizontal part of the tergite ; median field of tergite 2 rugulose but usually with small, smooth median area. Hypopygium thin, membranous, with numerous lateral creases. Ovipositor sheath slightly shorter than the hind tibia.

Male.—Antenna pale beneath.



Figs. 1–3.—*Apanteles :* (1) *tedellae* sp. n., ♀, lateral excavate area of scutellum ; (2) same of *lemariei* sp. n., ♀ ; (3) *tedellae* sp. n., ♀, part of fore wing.

Czechoslovakia : Jedovnice, 5 ♀, one the type, bred v.1957, 1 ♂, 1 ♀, bred iv.1957 (*Kristek*). All bred from *Epinotia* [*Epiblema*] *tedella* Clerck, a Tortricid injurious to spruce.

Sweden : Skåne, Ring sjö ; Degaberga : Röstanga ; Höör dist ; 8 ♀, 7 ♂, vi–vii.1938 (*D.M.S. Perkins & J. F. Perkins*). Type in Coll. Capek.

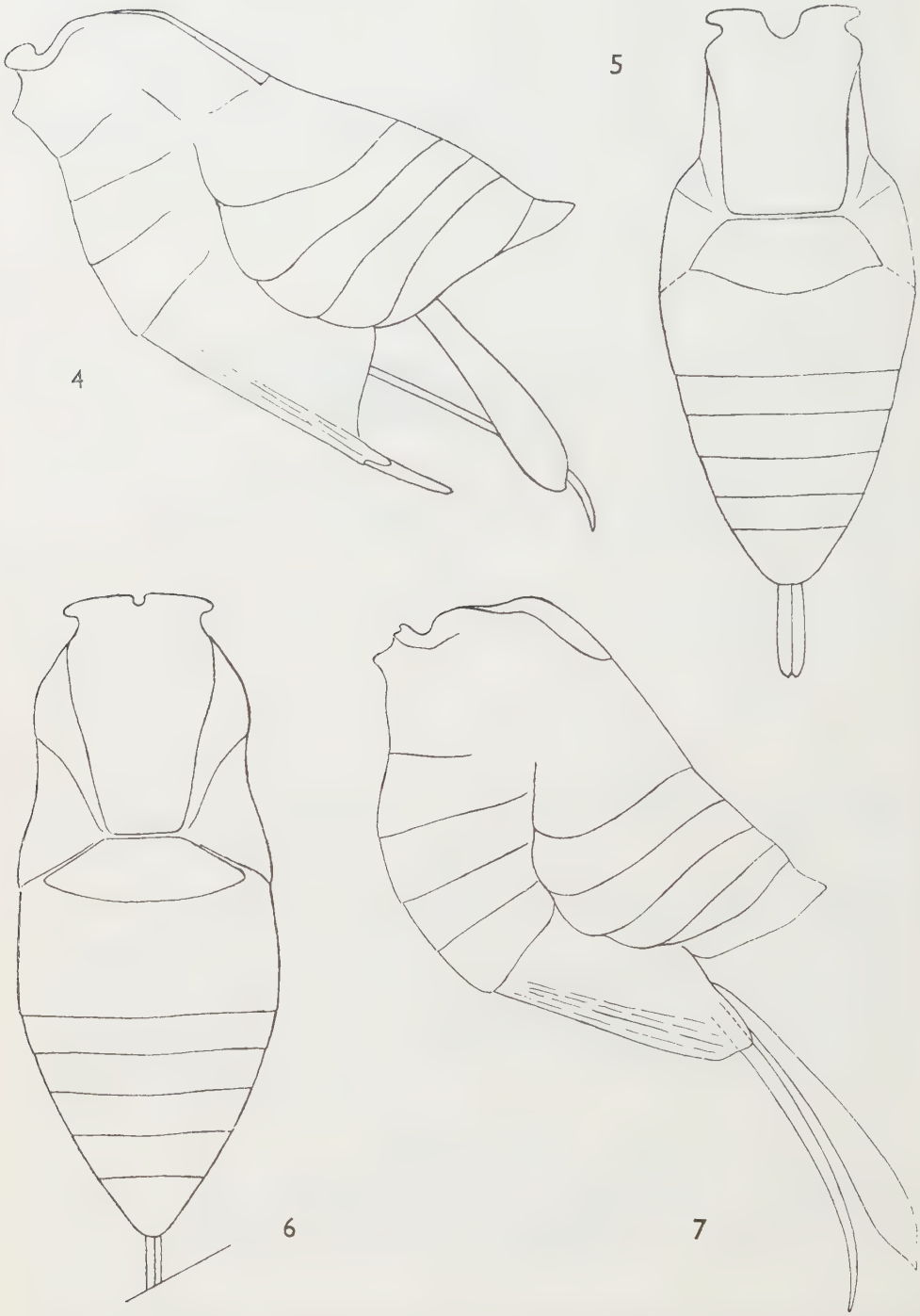
In spite of a superficial resemblance to such species as *vitripennis* Hal. and *fulvipes* Hal. (Wilkinson's group A), this species is, in fact, not at all closely related to them. It is, however, very much like *parasitellae* Bé (Wilkinson, 1945 : 189) with which it may be compared as follows : *parasitellae* has the antenna shorter, segments 16–17 being not noticeably longer than wide and the flagellum noticeably less bristly ; the propodeum of *parasitellae* frequently shows an ill defined, very uneven, medial keel ; tergite 1 is less narrowed apically and the median field of tergite 2 is more transverse and almost reaches the lateral margin of the segment ; also, the ovipositor of *parasitellae* is slightly longer than the hind tibia.

The two species described above were received for identification from Dr. Miroslav Capek of the Forest Research Institute, Banska Stiavnica, Czechoslovakia.

(see overleaf for figs. 4–7)

Reference

Wilkinson, D. S., 1945, Description of palearctic species of *Apanteles*. *Trans. R. ent. Soc. Lond.* **95** : 35–326.



FIGS. 4–7.—*Apanteles :* (4)–(5) *lemariei* sp. n., ♀, gaster : (4) lateral ; (5) dorsal. (6)–(7) *tedellae* sp. n., ♀, gaster : (6) dorsal ; (7) lateral.

ON THE GENUS *MACROSTOMUS* WIEDEMANN (DIPTERA : EMPIDIDAE) WITH NOTES ON THE INCLUDED SPECIES AND NEW SYNONYMY

By Kenneth G. V. Smith

(*Hope Dept. of Entomology, University Museum, Oxford*)

Dr. L. R. Cole recently gave me some small Empididae taken by him during the Oxford University Expedition to British Guiana. These were clearly very close to *Rhamphomyia* and ran down to that genus in the keys of Melander (1927) and Collin (1933), but as Curran's genus *Axelempis*, in Curran (1934), where they were separated from *Rhamphomyia* by the couplet character " third antennal segment many times longer than wide ". Curran (1931 : 9) erected the genus *Axelempis* to receive two species from Panama which he placed in the sub-family Clinoceratinae. I have examined these specimens and find them to be Empidinae very close to the genus *Rhamphomyia*.

Collin (1933 : 210), in dealing with *Rhamphomyia* from Patagonia and South Chile, suggested that many of the South American species described by Bezzi (1905, 1909) may belong to the genus *Macrostomus* erected by Wiedemann (1817 : 60) with type species *Hybos ferrugineus* F. Collin (1933 : 210) also suggested that genital characters would establish the validity of Wiedemann's genus and he figured the tip of the abdomen of *M. ferrugineus* showing the genitalia *in situ*.

Dr. Cole's specimens, the types of Curran's *Axelempis*, and some of Bezzi's *Rhamphomyia* possess greatly elongated third antennal segments (fig. 1) and have genitalia (figs. 2, 5 and 7) similar in basic structure to Fabricius' type and should therefore be referred to *Macrostomus*. The generic synonymy is thus as follows :

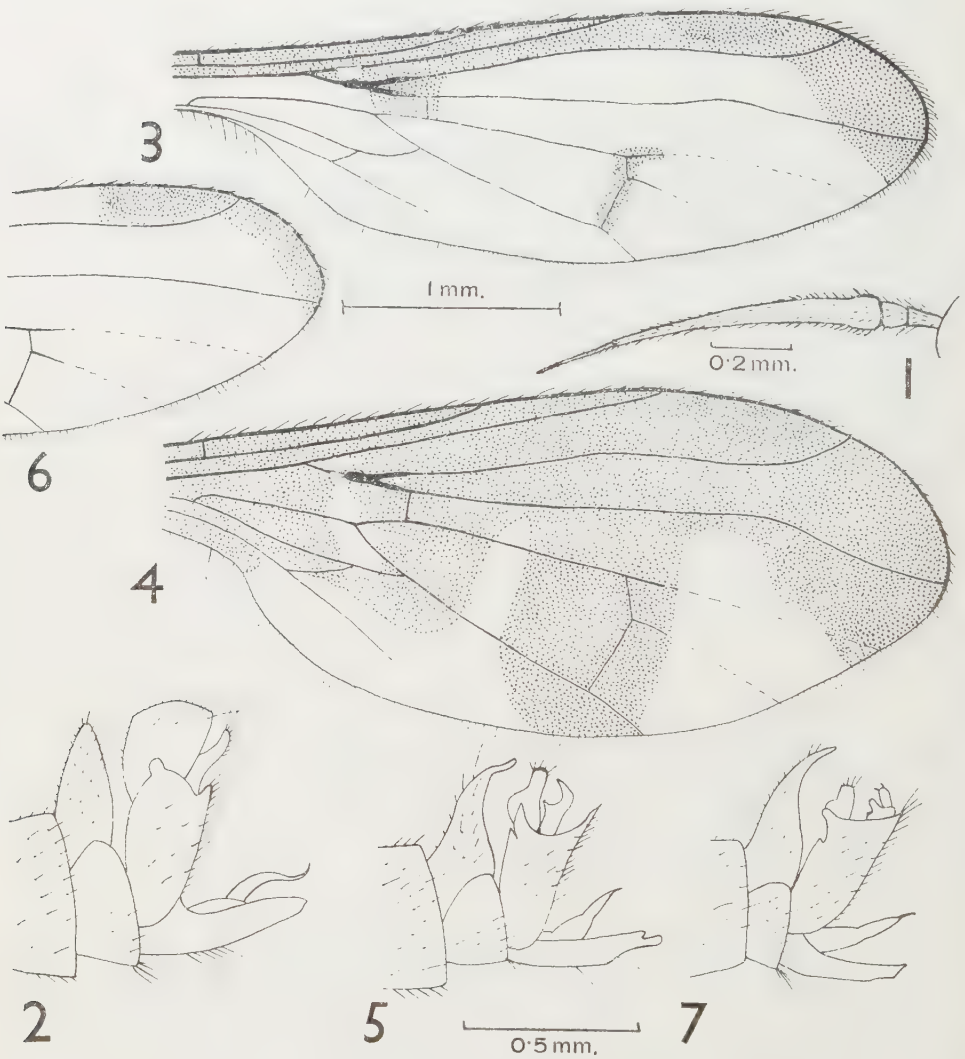
Macrostomus Wiedemann, 1817, *Zool. Mag.* **1** : 59–60.

Hybos (*partim*) *sensu* Fabricius, 1805, *Syst. Antliat* : 146, *nec* Meigen, 1803.
Rhamphomyia (*partim*) *sensu* Macquart, 1844, 5, 6, *Mém. Soc. R. Sci. Lille* : 224, *nec* Meigen, 1803 (*vide* Collin, 1933 : 210.)
Rhamphomyia (*partim*) *sensu* Bezzi, 1905, *Ann. mus. nat. Hung.* **3** : 424–60 ; 1909, *Acta Nova Leop. Carol.* **91** : 299–406, **syn. nov.**
Axelempis Curran, 1931, *Amer. Mus. Nov.* **467** : 9, **syn. nov.**

Collin (1933 : 211) listed species of *Rhamphomyia* described from Bolivia and Peru by Bezzi (1905, 1909), indicating with an asterisk those he regarded as probably belonging to *Macrostomus*. Unfortunately Bezzi's (1905) types, described from material in the Hungarian National Museum, Budapest, were destroyed in the autumn of 1956. However, through the kindness of Dr. Hertel I have examined Bezzi's (1909) types from the Staatliches Museum für Tierkunde, Forschungstelle, Dresden. The following list of species may now definitely be regarded as belonging to the genus *Macrostomus* :

ferrugineus (Fabricius) (*Hybos*), 1805, *Syst. Antliat :* 146. Type species.
nigriventris (Macquart) (*Rhamphomyia*), 1844, 5, 6, *Mém. Soc. R. Sci. Lille* : 224 (*vide* Collin 1933 : 210).
apicalis (Bezzi) (*Rhamphomyia*), 1909, *Acta. Nova Leop. Carol.* **91** : 330. **comb. nov.**
arcucincta (Bezzi) (*Rhamphomyia*), *op. cit.*: 331–2. **comb. nov.**
argyrotarsis (Bezzi) (*Rhamphomyia*), *op. cit.*: 324–5. **comb. nov.**
dolichoptera (Bezzi) (*Rhamphomyia*), *op. cit.*: 328–9. **comb. nov.**
grallatrix (Bezzi) (*Rhamphomyia*), *op. cit.*: 326–7. **comb. nov.**

limbipennis (Bezzi) (*Rhamphomyia*), *op. cit.*: 329. **comb. nov.**
macerrima (Bezzi) (*Rhamphomyia*), *op. cit.*: 327–8. **comb. nov.**
perpulchra (Bezzi) (*Rhamphomyia*), *op. cit.*: 334–6. **comb. nov.**
pictipennis (Bezzi) (*Rhamphomyia*), *op. cit.*: 330–1. **comb. nov.**
fasciventris (Curran) (*Axelempis*), 1931, *Amer. Mus. Nov.* **467** : 9. **comb. nov.**
fulvithorax (Curran) (*Axelempis*), *op. cit.*: 9. **comb. nov.**



Figs. 1–7.—(1)–(4) *Macrostomus pictipennis* (Bezzi) : (1) antenna ; (2) ♂, genitalia ; (3) ♂, wing ; (4) ♀, wing. (5)–(6) *M. ferrugineus* (F.) : (5) ♂, genitalia ; (6) ♂, apex of wing. (7) *M. fulvithorax* (Curran), ♂, genitalia.

The following Bezzi (1905) species of *Rhamphomyia* from Bolivia and Peru probably belong to *Macrostomus* (*vide* Collin 1933 : 211), but since the types are destroyed definite assignations cannot be made until the species are rediscovered :—*abdominalis dolichocera*, *orthoneura*, *pulchriventris*, *rotundipennis*.

Macrostomus ferrugineus (Fabricius).

Hybos ferrugineus Fabricius, 1805, *Syst. Antliat* : 146.

Dr. Cole's specimens represent two species, *Macrostomus ferrugineus* (F.) and *Macrostomus pictipennis* (Bezzi). As mentioned by Collin (1933 : 210) two specimens stand under the name *Hybos ferrugineus* F. in the Fabricius collection at Copenhagen, only one of which is referable to this species, the other being an *Elaphropeza*. At the suggestion of Dr. S. L. Tuxen, who kindly sent these specimens for study, I have labelled the true *ferrugineus* as lectotype to avoid any confusion in the future. This is the specimen discussed and figured by Collin (1933 : 210). I have also added a label indicating that this is the specimen upon which Wiedemann's (1817) genus *Macrostomus* is based. The type has no antennae and the species is here redescribed from Dr. Cole's specimen.

Male.—Eyes very narrowly separated on frons and only slightly more separated on face ; face and most of occiput black dusted greyish but frons and upper part of occiput shining black without tomentum ; proboscis yellow, longer than head ; palpi yellow ; antennae finely pubescent with first and second segments yellow, third dark and greatly elongated.

Thorax and pleurae yellow with black bristles ; 4 pairs of weak dorsocentral bristles, posterior pair strongest ; acrostichal bristles absent ; few weak hairs on propleurae, 3 bristles on metapleurae ; notopleural bristle present with two weak hairs in front ; scutellum yellow with 4 black marginal bristles, outer pair very weak.

Abdomen yellow with darker dorsal patches. Genitalia black (fig. 5).

Femora yellow, posterior and median pairs darkened apically ; tibiae yellow, posterior pair darkened apically ; tarsi brownish.

Wings (fig. 6) hyaline except for dark apical patch. Halteres dirty yellowish.

Body length : 3·5 mm.

Redescribed from one male, British Guiana : Amatuk Falls, Potaro River, in forest, 26.viii.1959 (*L. R. Cole*).

The female is unknown.

Macrostomus pictipennis (Bezzi), **comb. nov.**

Rhamphomyia pictipennis Bezzi, 1909, *Acta Nova Leop. Carol.* **91** : 330–1.

Bezzi described *Rhamphomyia pictipennis* from a single female collected by W. Schnuse in Bolivia, but mentioned that the collector also took a male in the same locality. Since this was without a head, and presumably because it was not definitely associated with the female (*i.e.* not taken *in cop.*), he did not describe the male beyond commenting on the clear wings and how this contrasted with the heavily patterned wings of the female. The type female is badly damaged and only the thorax and a fragment of the distinctive wing remain. The following redescription is based upon both sexes from Dr. Cole's material.

Male.—Eyes very narrowly separated on frons and only slightly more separated on face ; frons, face and occiput black dusted greyish ; proboscis longer than head, yellow, darker at base ; palpi dark ; antennae dark, finely pubescent, with the third segment greatly elongated (fig. 1) ; prothoracic " collar " with fringe of bristles.

Thorax reddish-yellow, pleurae more yellowish, all bristles black ; usually 3 pairs of dorsocentral bristles, but sometimes a fourth present, acrostichal bristles absent ; 3 propleural, 3 to 6 metapleural and 1 strong notopleural bristles present ; scutellum reddish-yellow with 4 marginal bristles, the inner pair longer.

Abdomen shining black, reddish-yellow at base. Genitalia black (fig. 2).

Legs mainly reddish-yellow, all femora yellow, but posterior and median pairs darkened at tip ; tibiae yellow with posterior and median pairs blackish at tip and posterior pair darker yellow ; anterior tarsi with first segment dark brown, whitish at tip, second segment dark with white median and apical rings, third and fourth segments dark with white tips, last segment dark ; median and posterior tarsi blackish ; posterior tibiae with 4 fine black dorsal bristles.

Wings (fig. 3) darkened along the costal border including the apex of the wing. Anterior cross vein and apex of discal cell also clouded. Third longitudinal vein bowed forward for a short distance between end of discal cell and wing apex.

Female.—Similar to male but eyes more widely separated on frons; all tarsi blackish; posterior femora and tibiae pennate dorsally and ventrally; median femora pennate ventrally.

Wings (fig. 4) broader and much more heavily and extensively patterned.

Body length: male, 3·5 mm.; female, 4·0 mm.

Redescribed from three pairs (♂ ♀) *in copula* with prey and a single female with prey, 7.viii.1959 and a single male, 12.viii.1959, in forest, British Guiana: Amatuk Falls, Potaro River (*L. R. Cole*).

The prey of two of the pairs *in copula* and the single female consisted of winged male ants of the genus *Solenopsis* Westwood (*det.* W. W. Kempfe). The other pair had as prey a small Ephemeropteron.

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